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[Contribution from the Bureau of Animal Industry, A. D. Melvin, Chief, cooperating with the Bureau of Crop Estimates, Leon M. Estabrook, Chief.]

MEAT SITUATION IN THE UNITED STATES.

PART IV.

UTILIZATION AND EFFICIENCY OF AVAILABLE AMERICAN FEED STUFFS.

BY

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EXPLANATORY STATEMENT.

In the winter of 1913–14 a committee of well-known investigators, familiar with agricultural conditions, was appointed by the Secretary of Agriculture to consider the economics of the meat situation. This committee was composed of Dr. B. T. Galloway, Assistant Secretary of Agriculture, as chairman; Dr. H. J. Waters, president of the Kansas State Agricultural College; Prof. C. F. Curtiss, dean of the Iowa State College of Agriculture and Mechanic Arts and director of the Iowa Agricultural Experiment Station; H. W. Mumford, professor of animal husbandry, University of Illinois; Dr. A. D. Melvin, Chief of the Bureau of Animal Industry, United States Department of Agriculture; and Dr. T. N. Carver, Director of the Rural Organization Service, United States Department of Agriculture. Mr. Leon M. Estabrook, Chief of the Bureau of Crop Estimates, was made secretary of the committee.

No formal report was prepared by this committee, but, at the suggestion of the committee, independent inquiries dealing with several phases of the meat situation were undertaken by specialists of the United States Department of Agriculture. The results of these inquiries have been crystallized by the department in a series of five reports, under the general title of the "Meat Situation in the United States," each report complete within itself and bearing a separate number in the series of reports of the Office of the Secretary, as follows:

Part I. Statistics of Live Stock, Meat Production and Consumption, Prices, and International Trade for Many Countries. By George K. Holmes, Bureau of Crop Estimates. (Report No. 109.)

Part II. Live Stock Production in the Eleven Far Western Range States. By Will C. Barnes and James T. Jardine, Branch of Grazing, Forest Service. (Report No. 110.)

Part III. Methods and Cost of Growing Beef Cattle in the Corn Belt States. By J. S. Cotton and Morton O. Cooper, Office of Farm Management, and W. F. Ward and S. H. Ray, Animal Husbandry Division, Bureau of Animal Industry. (Report No. 111.)

Part IV. Utilization and Efficiency of Available American Feed Stuffs. By W. F. Ward and S. H. Ray, Animal Husbandry Division, Bureau of Animal Industry. (Report No. 112.)

Part V. Methods and Cost of Marketing Live Stock and Meats. By Louis D. Hall, F. M. Simpson, and S. W. Doty, Office of Markets and Rural Organization. (Report No. 113.)

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UTILIZATION AND EFFICIENCY OF AVAILABLE AMERICAN FEED STUFFS.

SUMMARY.

The Animal Husbandry Division, in cooperation with the Bureau of Crop Estimates, has made a study of feeding stuffs in which it is shown that a tremendous waste of feeding stuffs occurs annually on American farms. The total loss to farmers from the waste of corn fodder and straw amounts to about $102,860,000 each year.

In 1914 about 120,000,000 tons of straw was produced in the United States. Of this, 55 per cent was fed to live stock, while 15 per cent was burned, 8 per cent sold, and 22 per cent plowed under or otherwise disposed of. Greater publicity concerning the value of straw, its use as a filler in commercial feeds, and in various manufactures might aid somewhat in preventing its waste.

Corn stover produced in the United States is estimated at 245,253,000 tons, of which 81.5 per cent was fed to cattle and other stock. No data were obtained as to the percentage of this amount (81.5 per cent) that is wasted in feeding. At least 35 per cent of this total amount represents an actual waste. This waste can be checked through the use of better methods for feeding fodder and stover, and it can be almost entirely stopped through the use of silos. Of the total amount of stover produced, 3.7 per cent was burned, 10.2 per cent plowed under, and the rest sold or disposed of in other ways. Not only the fodder burned is wasted, but the fodder plowed under would also largely come under this category, as it is permitted to stand in the field until spring, and by that time has lost much of its fertilizing value through loss of leaves and leaching. Too great emphasis can not be placed upon the advantage of using as large an amount as possible of these materials for silage. Only 8.1 per cent of the corn acreage is now used in this way.

To feed the large quantities of straw and stover now wasted would necessitate the feeding of large quantities of concentrated feeds which are now disposed of in a less economical manner. For instance, more than 810,000 tons of cottonseed meal was used in six southern States in 1914 for fertilizer. If this had been fed to live stock and the manure used for fertilizer the value of the meal would have been increased from 50 to 85 per cent. This is true of all the oil meals used for both fertilizer and feeding purposes. The food value of these concentrated protein materials can be further increased through the more extensive use of silage.

A nation-wide campaign to teach the value and use of food-unit values for all the more common feeding stuffs would be a great step toward a more perfect agricultural system.

More experimental study of spineless cactus as a feed stuff is needed. Cactus will never be of great economical importance elsewhere than in the hot semi-arid regions.

Common sugar cane and Japanese sugar cane are very promising forage crops for the extreme South. The utilization of the by-products of sugar cane, such as cane tops, bagasse, and blackstrap molasses, may save millions of dollars to cattlemen in the cane-growing section. Millions of tons of cane tops are permitted to go to waste every year.

Feterita and Sudan grass are two of the newer forage crops which may play a most important part in feed production in the semi-arid West. Sudan grass is an important hay crop in other sections of the country also because of its large yields and its resistance to drought.

Teosinte yields from 15 to 50 tons of green forage per acre in the extreme South. It is a promising crop.

The high cost of labor prevents roots from being more generally used in this country. Silage crops are more economical and serve almost the same purpose.

The animal by-products, such as tankage, fish meal, etc., are excellent feeds for hogs, but are little used for cattle.

Dried brewers' grains and distillers' by-products are in general use and are generally fed with care. Improvements could probably be made in the method of feeding the slop by the use of other concentrated feeds and some dry roughage.

Canning factory refuse could be increased in value by storing in silos rather than in huge piles in the open.

Beet pulp is usually handled in an economical manner and comparatively little of it is wasted.

NEED FOR STUDY OF EFFICIENCY OF FEED STUFFS.

American methods of feeding cattle and other live stock have never involved a very close study of the economics of the national feed situation. Heretofore feeds, labor, etc., have been very abundant and have been available at such low prices that close calculation in their use has been unnecessary. But competition has now arisen to such an extent, and the prices of raw materials in comparison with sale values of the finished product have become so high, as to make cattle feeding in a great many cases unprofitable. During past years the tendency in this country has been for a few feeders to produce the entirety of our beef supply. In European countries this situation, to a large extent, is reversed, each farmer feeding a small number of cattle. This difference may be accounted for in three ways: First, cattle feeding in Europe has been practiced for more than 200 years. Second, farmers in general in those sections seem to have a greater knowledge of the nutritive value of feeds, as well as greater ability in the practical use of them. Third, the dense population in European countries has necessitated the use of very intensive methods along all lines of production. European farmers as a whole show greater knowledge of the scientific phases of the different feeding operations than American farmers. At the present time European feeders are using a great deal of cottonseed meal, and it is a fact

that they know more about its feeding value than the average American farmer. Putting the matter tersely, one of the greatest needs of the American farmer to-day is education in the use of both commercial and farm-grown feeds.

In purchasing feeding materials, European farmers consider the cost of the feed per pound of nutrients. Few American farmers have a definite idea of the different nutrients which compose the feed stuffs or their uses. With the State feed control offices and with laws regulating the adulteration of feeds, American farmers have excellent facilities for protection in the purchase of feeding materials, but few farmers avail themselves of the opportunities offered in this way. Such protection is valuable only when the farmer has some idea of the nutritive value of feeds, and, having this knowledge, makes use of it in the purchase of supplies.

If some simple method of calculating the comparative feeding values of various feeds could be devised, so as to show numerically the food value of each feed, and if such food value, along with the percentage of digestible protein, were printed on each tag attached to a feed bag, the farmers would undoubtedly soon learn the relative values of the various common feeds. Such a system would tend toward a more economical use of feeds.

In the United States the chemical analysis of feeding stuffs is usually printed on tags which are attached to each sack of feed. This chemical analysis alone is of little value to the feeder. If the amount of digestible nutrients in each 100 pounds of the feed could be shown in addition to the chemical analysis, the information conveyed would be far more valuable to him.

In gathering material for this report, studies have been made of nearly all of the feed stuffs which are available in the United States. Certain of our newer feeds need study and exploitation. However, as a rule, these newer feed stuffs are limited to certain comparatively small sections of the country; the common feeds which have been in daily use for years offer greater opportunity for improvement.

This report deals chiefly with the more efficient utilization of the extensively available feeds rather than the exploitation of feeding materials of more recent origin or less extensive use. As a rule, new feeds are extensively exploited by individuals or corporations, while opportunities for the more efficient utilization of our older or more common feeds have been very largely overlooked. As an example, corn and small grains have been grown in this country since it was first settled, and data which are given later show the greatest total loss of available feeding material is from the misuse of the by-products of such crops. Lack of knowledge concerning the efficient use of available feeds is costing the American farmer enormous sums

annually. This loss will not be stopped unless its amount, together with suggestions as to how it may be averted, is forcibly brought to the attention of farmers.

RELATION OF CATTLE MARKETS TO FEED SUPPLIES.

Our great beef cattle markets have developed at convenient points intermediate between producer and consumer. The beef-cattle industry around these markets has grown rapidly. The centralized markets played a most important rôle in the development of the cattle industry of the West. Cattle were produced on the western ranges, while the center of consumption was east of the Mississippi and north of the Virginias and Kentucky. The markets located at the central points afforded convenience in handling both the live cattle and the meat products and lessened the cost to the consumer.

During recent years the centers of cattle production have been gradually shifting to a certain extent, and beef production is being taken up in new territory. When this is considered along with the fact that refrigeration and transportation facilities for beef products have improved greatly it is seen that the large centralized packing plants now in existence may not be so essential to future development of the industry as formerly. The tendency will probably be to raise and to feed the stock nearer the places where the feeds and pastures exist and to ship the live stock or meat products to the large distributing centers or areas of consumption.

Frequently it will be cheaper to utilize the feeds near the points where they are produced, and ship the fattened cattle or the dressed meat, than to ship either the feed or the cattle, or both, to sections near the great packing houses for fattening and subsequent slaughtering. The smaller packing houses and abattoirs located in the areas producing feed stuffs may play a prominent part in the development of the cattle industry of the future.

Cottonseed meal, a southern product, is being extensively used at northern feeding plants. Many southern cattle are shipped into the North and West to be finished for market, while the meat is often returned south for sale. In the South, where enormous quantities of grass and fodder are going to waste, not a large percentage of the cottonseed meal is being used for feeding. The Southern States should raise, fatten, and slaughter their cattle to the extent of supplying their own needs; after that if a surplus of either cattle or cottonseed meal exists it should be shipped to other sections of the country. Freight is often paid several times on feeds and feeders for fattening purposes, paid again on the cattle going to some far-off market for slaughter, and again on the dressed meat going back to the place where the cattle were fattened. This seems like a most extravagant

waste of money and is a state of affairs which, to a certain extent, could be remedied by raising, fattening, and slaughtering cattle in the same section. These apparently wasteful methods are frequently justified, however, by existing conditions which are often overlooked by the casual observer. The lack of adequate slaughtering facilities, well organized and equipped markets, the necessary capital, transportation and refrigeration in transit facilities, and a constant and sufficiently large supply of cattle and hogs will often prevent the slaughtering of cattle at a profit in the section where they are raised and fattened. In such cases it may be better to ship the fattened animals to some of the large markets.

Similar conditions exist in a portion of the West, embracing Colorado, Nebraska, Wyoming, the Dakotas, and Montana, where enormous quantities of roughages are wasted or can be purchased cheaply, and where cattle are plentiful, but few are finished for the market.

STRAW.

In European countries the greatest care is given to the feeding of all straws and other farm roughages. Frequently the straws are chopped up and mixed with other feeds, such as beets, mangels, silage, etc., so as to make the straw more palatable. Some farmers are so careful in the preservation of straw that after it has been used for bedding, and later distributed over their fields, it is raked up and again used for bedding, after lying on the ground until it has become clean and free from manure. There are no signs of such thrift in this country. In certain sections opportunity is not even given the cattle to consume the straw and fodder, for in some states almost the entire crop is burned. Fifteen per cent of the straw produced in the United States, as shown by the Bureau of Crop Estimates, is burned, and probably as much as this is otherwise wasted. Of course in some of the sections of the United States where straw is burned there are few cattle, and the material consequently has little or no value because of the distance from market; nevertheless some provision should be made for its utilization. If this straw were combined with some of the home-grown concentrates, not only would the feed yield a profit in return for beef but the manure would have great value in building up the soil.

In certain sections of the United States straw of good quality when baled costs as much as $15 per ton, and sometimes even higher prices are paid. The value of oat straw, based upon present conditions, will probably run somewhat higher than $10 per ton, while the average value of all straw produced is probably about $5 per ton. In other words, straw produced on the farm is probably worth this amount

to the farmer if he will use it properly in his farming operations. According to the Bureau of Crop Estimates, the actual value that is placed upon straw of all kinds is about $3.70 per ton. Based upon this value, farmers are losing something like $1.30 per ton for every ton of straw produced. This loss per ton would constitute a total annual loss on the whole crop of about $156,000,000.

To bring these straws up to their real value on the farm would necessitate their being fed or used as bedding for cattle and other live stock. The gain which accompanies this feeding because of increased soil fertility can hardly be calculated, but needless to say it would be enormous. Of all systems for obtaining permanent soil fertility, none is so practical or as easily available as that of feeding live stock.

The economical feeding of cattle necessitates the use of large amounts of roughages. Experiment stations have found no more efficient way of utilizing farm roughages than through cattle. Considering these factors in all their phases it seems that there is little doubt that systems of crop growing, permanent soil fertility, and cattle feeding are interdependent.

The total production of grain straw in the United States in 1914 is estimated at about 120,000,000 tons, or an average of 1.14 tons per acre from 105,406,000 acres producing wheat, oats, barley, rye, rice, flax, and buckwheat. At an average value of $3.71 a ton, the total value of this straw would be about $446,000,000. The magnitude of the annual output of straw may be appreciated when these figures are compared with the total production of cultivated hay, which in 1914 was estimated at 70,071,000 tons. In other words, there is about one and two-thirds as much straw as cultivated hay produced in the United States. The total value of straw as given above is exceeded only by the value of such crops as corn, wheat, oats, hay, and cotton.

Of the total production of straw, it is estimated that about 55 per cent (64,708,000 tons) is fed to live stock, 15 per cent (17,613,000 tons) is burned, 8 per cent (9,212,000 tons) is sold, and 22 per cent (26,221,000 tons) is plowed under or otherwise disposed of. The amount of straw burned (17,613,000 tons), if valued at the average of all straw for the United States, namely, $3.71 per ton, would be worth about $65,000,000. Of course, in the sections of the country where straw is burned it is not valued at this amount, but this represents, roughly, the amount of potential feedstuffs of which no use is made.

The following table, which gives the results of an investigation by the Bureau of Crop Estimates, shows the quantity in tons and percentages of the various kinds of straw used for different purposes:

Uses made of straw.

Kind of straw.	Yield per acre.	Value per ton.	Total value.[1]	Quantity.[1]						Percentage.				
				Fed.	Burned.	Sold.	Plowed under.	Bedding, etc.	All uses.	Fed.	Burned.	Sold.	Plowed under.	Bedding, etc.
	Tons.			*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
Wheat	1.19	$3.01	$192,059	28,586	14,357	5,168	7,210	8,486	63,807	44.8	22.5	8.1	11.3	13.3
Oat	1.09	4.57	191,136	30,029	1,506	3,011	2,928	4,350	41,824	71.8	3.6	7.2	7.0	10.4
Barley	.98	2.39	17,762	4,459	988	268	855	862	7,432	60.0	13.3	3.6	11.5	11.6
Rye	1.29	4.90	16,087	791	397	686	696	713	3,283	24.1	12.1	20.9	21.2	21.7
Rice	2.03	6.11	8,603	843	365	79	13	108	1,408	59.9	25.9	5.6	.9	7.7
All straw	1.14	3.71	436,867	64,708	17,613	9,212	11,702	14,519	117,754	54.9	15.0	7.8	10.0	12.3

[1] 000 omitted after each number in these columns.

There is considerable variation in the uses to which the different kinds of straw are put. Thus, although nearly 72 per cent of oat straw is fed, only 24 per cent of rye straw is fed; and while 22 per cent of the wheat straw is burned, less than 4 per cent of the oat straw is burned. In North Dakota a larger proportion of the straw is burned than in any other State. About 66 per cent of the wheat straw and 96 per cent of the rye straw in that State is burned, but only 20 per cent of the barley and 6 per cent of the oat straw is disposed of in that manner. Including flax and buckwheat straw, this amounts to about 2,500,000 tons.

Of the total amount of straw produced annually in the United States, 54.9 per cent, or 64,708,000 tons, is estimated to have been used for feeding purposes. The amount used for bedding is estimated at 12.3 per cent, or 14,519,000 tons. According to these data the total amount used in live-stock production would be about 67.2 per cent, or 79,227,000 tons. The straw that was sold, plowed under, and burned amounts to about 32.8 per cent of the total, or 38,527,000 tons. More than one-third of the total production of straw is being used to disadvantage, of which one-half is an absolute loss. If straw is not used by live stock or plowed under, its value as a soil-enriching material is mainly lost. Its chief value as a fertilizing material lies not in its fertilizing elements, but in its tissues as a source of humus. The burning of straw, then, even though the ashes leave a small amount of additional mineral matter in the soil, results in an almost total loss. Straw is seldom burned, except in the West. The people in that section follow this method mainly because of custom rather than because of any inability to purchase, feed, or market meat-producing animals. They have come to believe that the straw is of no value because it has never been used for anything in that section. In some of the Western States a campaign has been made by the colleges of agriculture and institute workers to get farmers to use a portion of their waste straw for spreading over

their grain fields. There is still much room for improvement in this respect.

A very interesting series of experiments has recently been completed at the Indiana Experiment Station, testing the feeding value of oat straw. It was found that a ration of corn silage, corn, and cottonseed meal was just as valuable for economy and extent of gains when used with oat straw as the same ration when fed with clover hay. In other words, oat straw can be used advantageously and profitably to replace clover hay when fed with corn silage, corn, and cottonseed meal. As such a ration is extensively used in various parts of the United States, the practical value of this can be readily seen.

Straw when fed to fattening animals has a certain corrective property, and a great many practical feeders advise that it be kept before the steers at all times. It is especially valuable in feeding calves or baby beef. Straw is rather bulky and has great absorbing power; these qualities are a great help in offsetting the heating effects of concentrated feeds, especially with cattle that are consuming a heavy grain ration.

The methods of feeding and systems of management which are in vogue in Europe, while necessary in that country, are not so essential in the United States. In that country straws are very largely chopped or shredded before feeding, and some of the feeds are cooked while others undergo special preparation requiring much labor. Feeders in Europe can afford to do this because their feeds are comparatively high, while labor can be obtained at a low rate, and the value of the expensive feeds is economically increased through the use of cheap labor. Under those conditions the additional labor is used at a profit. Conditions are not parallel in America. Labor is much more expensive and the additional labor that would be required to prepare our feeds in a similar manner would result in a financial loss. With an increased population, conditions in America may change, but at the present time European methods, while very instructive in themselves to American feeders, are not entirely applicable to this country.

There are certain sections where, at the present time, owing to market conditions, lack of concentrated feeds at reasonable prices to supplement these straws, etc., cattle feeding is hardly possible. Under such conditions the directing of these materials into manufacturing channels seems to be a probable solution. Heading and turning the whole straw under the soil would mean a great saving compared with the present methods.

Specific advice concerning the details of the utilization of wasted straws can not be taken up in this discussion. There has always been a more or less limited demand for American straws in the manufacture of such articles at hats, paper, strawboard, packing

cases, horse collars, etc. With the development of modern machinery and manufactured products more straw will probably be used.

In order that the reader may get a more definite idea of how straw can often be used economically, a number of rations to be used in wintering the breeding herd of beef cattle are given herewith.

RATIONS FOR WINTERING BREEDING COWS.

	Pounds.
Ration 1—	
Straw	10
Silage	20
Cottonseed meal or linseed meal	1½
Ration 2—	
Straw	20
Cottonseed cake or oil cake	2
Ration 3—	
Straw	10
Shock corn	10
Cottonseed meal	1

In case it is believed the animals should have more feed, the straw should be increased.

A yearling may be fed three-fourths of the ration mentioned, and may be expected to come through the winter in fair to good condition. The breeding herd or stocker steers can be wintered very economically on any of the rations named.

It is not at all uncommon for some of the Western States, such as Kansas, Nebraska, the Dakotas, and Montana, to have much more grass than they have cattle. This is partly due to the practice of buying steers in the spring. If stocker cattle are very high at that time some of the pastures remain unfilled. Where there is an abundance of straw on hand stocker cattle could be bought in the fall of the year, when such stock is relatively cheap, and wintered on straw and cottonseed cake or oil cake. This would insure having steers for the grass during the summer. This method would utilize waste feeds and waste pasture and would tend to increase the meat supply.

For fattening animals straw should always be within reach so that the animals may eat straw at will. They will usually eat from 3 to 5 pounds per day.

CORN STOVER.[1]

The estimated total yield of corn stover in the United States is 245,253,000 tons. The production of the different sections is as fol-

[1] The data on corn stover here given are based upon estimates made by county crop reporters of the Bureau of Crop Estimates. The proportion of the corn acreage stated as used for silage (8.1 per cent) and that cut green for feed (10.9 per cent) are regarded by some experts as excessive. More conservative estimates would be 5 per cent put into silos and 7 per cent cut green for feed. These differences, however, do not materially affect the conclusions drawn from the data. The proportion of the corn crops which goes into silos is rapidly increasing from year to year, and within a few years will exceed the percentage shown by crop reporters' estimates.

lows: North Atlantic, 8,176,000 tons; South Atlantic, 12,824,000 tons; North Central east of the Mississippi River, 58,038,000 tons; North Central west of the Mississippi River, 125,352,000 tons; South Central, 39,193,000 tons, and Far Western, 1,670,000 tons. According to figures from the Bureau of Crop Estimates, the corn stover was disposed of as follows: 57.9 per cent (142,000,000 tons) was fed to cattle; 23.6 per cent (58,000,000 tons) fed to other live stock; 3.7 per cent (9,000,000 tons) burned; 10.3 per cent (25,000,000 tons) plowed under; 2.6 per cent (6,000,000 tons) sold, and 1.9 per cent (4,000,000 tons) used for other purposes, most of which was for bedding. The States that lead in the practice of burning corn stover and the percentage of the total crop that is burned are given herewith: Texas, 8 per cent; Louisiana, 7 per cent; Arkansas and Iowa, 6 per cent; Missouri, Nebraska, and Mississippi, 5 per cent; Illinois, 4 per cent; West Virginia, Indiana, South Dakota, Kansas, Kentucky, Oklahoma and Idaho, 3 per cent. The other States burn quantities ranging up to 3 per cent of the total production. Corn is grown in all States, but 20 report that no stover is burned. The North Central States west of the Mississippi and the South Central States lead in the practice of burning, with 4.4 and 4.3 per cent respectively. The yield of dry stover, as estimated, varies from 1 to 6½ tons per acre, with the average close to 3 tons per acre. The estimated value of this is about $2 per ton.

The disposition of corn stover in the United States is very similar in character to the disposition of straws, though differing somewhat in degree. About 55 per cent of the straw is fed, while 81.5 per cent of the stover is utilized in this way. Of the amount of stover fed to live stock, however, it is estimated that at least 35 per cent is wasted. Straw is burned to the extent of 15 per cent, while only 3.7 per cent of the stover is disposed of in this manner. Straw sold amounted to 7.8 per cent, while only 2.6 per cent of the stover is marketed. This is to be expected since straw is more easily handled in marketing. About 12 per cent of the total straw is used for bedding, while less than 2 per cent of the stover is used for this purpose.

It is needless to say that burning is practically an absolute waste. It seems that burning offers a quick and easy method of cleaning the ground preparatory to plowing. This system is most largely practiced where the corn is snapped or husked, leaving the stalks standing in the field.

Corn stover is an excellent roughage for use in wintering cattle when a small amount of grain or other concentrate is used with it. It is especially valuable in the wintering of mature breeding cows. In some sections of the United States cattle are wintered with stover

as the sole roughage, supplemented with a small amount of grain. Breeding cows or stockers will winter nicely on stover and oat straw, together with a small amount of either cottonseed meal, linseed-oil meal, or corn. The meal when fed without other grain should be fed in the cake form and preferably of nut size. When fed in this manner it is not lost by dropping through cracks or blowing away and is not spoiled by being wet with saliva or rain.

In preparing stover for feeding purposes, cutting and shocking under general conditions involves less labor, and the waste is about offset by this factor. Chopping or shredding increases the palatability and reduces the amount of storage space for housing the crop, but the labor involved in this method increases the cost of preparation very much. Where cheap power and labor are available on the farm, shredding or cutting is to be recommended.

Of all methods of handling corn, ensiling is by far the most economical, although, because of the need for the grain itself, not all corn can be put into the silo. In sections where pastures are not available it is economical to use silage throughout the year. Of the total acreage of corn in 1914 (103,435,000 acres), about 8.1 per cent, or 8,378,000 acres, was put into the silo. About 10.9 per cent of the total acreage, or 11,274,000 acres, was cut and fed as green feed. Nearly 81 per cent was allowed to mature for grain. Of the corn that was left to mature for grain, 57.7 per cent was snapped. That which was cut and shocked in the field is estimated as 24.9 per cent. That which was cut and hauled to the barn for husking, most of the stover of which was shredded, amounted to 9.1 per cent. Only 2.6 per cent of the corn which was left to mature in the field was pastured or "hogged down." The balance, or 5.7 per cent, was handled in some other way.

A practice in certain sections which is both uneconomical and wasteful is that of "pulling the fodder" or stripping the leaves from the stalk, leaving the stalks to be subsequently burned. Of the corn that is allowed to mature in the field about 19 per cent is handled in this way. Another wasteful practice is that of "topping" the corn. By this method the stalk above the top ear is removed and either stored or shocked for fodder. About 13 per cent of the matured corn is handled in this way. Of the stalks that are left standing in the field 35 per cent are pastured, 33 per cent are plowed under, and 12 per cent are burned.

The total value of the stover produced in the United States in 1914 was about $436,867,000. Almost 4 per cent, as stated above, or about $14,757,000 worth of this stover was burned. Such facts are astonishing when one considers the food value of the material thus destroyed. To utilize the straw and stover which at the present time are being wasted would, if these materials were fed to cattle, involve the use

of large amounts of concentrated feeds. From the standpoint of national economics, this is just what is needed, since we are annually exporting from this country large amounts of concentrated feeds, such as cottonseed meal and cake, corn, molasses, peanuts, and beans. Besides the feed which is exported, more than 1,000,000 tons of cottonseed meal are annually being used directly for fertilizing purposes. The utilization of this meal and other feeds with our wasted straws and stover would mean not only a tremendous saving in the cost of producing beef and additional profit in the feeding of the cattle but also a tremendous saving in the cost of enriching the soil. The losses from these sources, from a nation-wide standpoint as well as from the standpoint of the individual farmer, constitute a greater loss than the total of all other losses (excepting that from disease) occurring upon the American farm to-day. The total loss occurring annually through the wasting of straws and corn stover amounts to about $102,860,000. Farmers should be told of these losses by all means and instructed in the methods by which they may be prevented.

BY-PRODUCTS OF OIL-BEARING SEEDS.

The cheapest source of protein to-day for cattle feeding is the by-products of our oil-bearing seeds. All the feeds necessary for the feeding of live stock can hardly be grown on the farm. Even under intensive European methods European farmers find it necessary to purchase a certain portion of their concentrated feeds. Of course if the entirety of the material which is needed for feeding purposes can be grown on the farm it is essential that this course be followed. With the existing farm conditions cattle feeding alone will not keep up soil fertility if this up-keep depends upon the feeds which are grown upon the farm entirely. Some of the plant food is bound to be marketed in the form of beef, milk, or other live-stock products. Besides this, other losses of plant food continually occur. On most farms the purchase of additional high-protein concentrates from a permanent soil fertility standpoint is essential. Such procedure, if carried on continually, and if a sufficient number of cattle are fed, should result in a sufficiently fertile soil without the use of other nitrogenous fertilizers. The use of lime, phosphates, and potash, however, where needed, should not be discontinued even though a large number of cattle are kept.

COTTONSEED MEAL AND LINSEED MEAL.

Cottonseed meal and cake are the most important of the by-products of our oil-manufacturing industry. It is the most important not only because of the quantity produced but also because of its great efficiency as an economical source of protein.

Next in importance to cottonseed meal is linseed meal. Linseed meal is produced in much smaller amounts than cottonseed meal, but in sections where it has been used for any great length of time it is the most highly favored of all the protein-supplying concentrates. In other sections cottonseed meal is favored or is gaining in favor. At the present time, however, linseed meal is a more expensive source of protein than cottonseed meal, even where a greater freight rate has to be paid to obtain the latter commodity.

Soy-bean, peanut, and sesame cake or meal are also by-products of oil-bearing seeds which have value in supplying protein in a concentrated form. These by-products can be obtained in this country only in small amounts. At the present time very few establishments are expressing the oil from such seeds.

Other important by-products of the oil-expressing industry are copra cake and meal, which is the residue from copra after expressing the coconut oil. Copra in turn is the kiln-dried or air-dried fruit of the coconut. Palm-nut meal, which at present is not obtainable at all in this country, is still another by-product of this industry.

American plants express more cottonseed and linseed oil than those of any other country in the world, but France leads in the pressing of all other oil-bearing seeds.

Correspondence with oil-expressing companies gives the information that this industry is likely to be a great deal more extensive within a few years; in fact, the companies say that a great opportunity is open for manufacturing along these lines. The greatest drawback in the development of the industry heretofore has been the fact that manufacturers have been unable to interest American farmers in feeding the by-product, nor have the manufacturers been able to dispose of it through other channels.

As American cottonseed-oil crushers have been unable to find a market for their entire output of meal and cake in the United States. nearly 400,000 tons of these feeds were exported in 1914. More than 500,000 tons were exported in each of the years 1912 and 1913. Some of this American-made meal and cake was sold in Europe at a lower price per pound than American feeders were paying for similar meal or cake at home. A high quality of meal is required for the European trade, and the percentage of protein must run between 40 and 55 per cent. This high-protein meal under present conditions is the most economical meal to buy, but high-protein meal is seldom sold on the domestic markets. In 1914 English feeders were paying $39 to $40 per ton for cake with an analysis of 48 to 55 per cent protein, while meal and cake in the United States with a test of only 38 per cent of protein was selling for $28 to $32. This discrimination is the result of an effort on the part of crushers to compete

with other oil cakes on European markets. It occurs also because Europeans know more of the value of such feeds and demand a better article than the average American farmer. Not only are crushers expanding their trade in cottonseed meal for feeding purposes, but they are heavily exploiting the use of cottonseed meal as a fertilizer. During 1914 about 1,000,000 tons, or one-half of the total amount produced, was used for application directly to the soil.

The following amounts of cottonseed meal were used for fertilizing purposes in each of the States named: Mississippi, 160,000 tons; Georgia, 251,981 tons; South Carolina, 188,192 tons; Connecticut, 7,000 tons; Alabama, 100,000 tons; Florida, 35,868 tons; Massachusetts, 7,000 tons; North Carolina, 75,000 tons.

There are other States which used cottonseed meal for this purpose, but the quantity was negligible or the data were unobtainable. In several States no meal is used at all for this purpose. The nitrogen in a ton of cottonseed meal is worth as much as the meal usually costs. At the same time, the use of cottonseed meal as a direct fertilizer is an exceedingly poor practice, since cottonseed meal, after being fed to cattle, will return 75 per cent or more of the original fertility to the soil in the form of manure. Only one-fourth of its original fertilizer value is lost in feeding to cattle, and cattle will usually make profitable gains on cottonseed meal when fed the necessary roughages.

At the present time we are exporting annually to England alone 150,000 tons of cottonseed meal, 200,000 tons of corn, and 50,000 tons of blackstrap molasses, as well as other feed stuffs. It would seem advisable to use at least a portion of these materials, together with our farm roughages, for putting more cattle, fatter cattle, and more dairy products on the market.

Denmark annually feeds 478 pounds of oil cake, most of which is cottonseed cake or meal, to each of the mature cattle in that country. The 1913 census showed that the United States had 56,527,000 head of mature cattle of the beef and dairy types. American dairymen and cattle feeders during the year 1913 used approximately 690,000 tons of cottonseed meal and cake for feeding purposes. (Note that the amount fed was only a little more than one-third of the total American production, although cottonseed primarily is a cattle feed.) Taking these figures as a basis, the United States uses approximately 24 pounds of cottonseed meal per head of mature cattle. Data could not be obtained for the consumption of linseed meal.

The cottonseed meal which is being produced in the United States should be almost entirely used at home for feeding cattle. An increased cottonseed-meal consumption could be brought about in three different ways: First, by feeding our present type of cattle more of

this feed; second, by improving the size and type of our cattle; and, third, by increasing the number of our cattle. The resulting increase in dressed beef could be used up in home consumption and in exports.

COCONUT BY-PRODUCTS.

At the present time dealers in edible oils advise that considerable opportunity is offered concerns that will develop the copra-crushing industry of this country, if they can find a market for their by-products. This material if crushed in the United States would offer a very valuable source of concentrated protein food. The by-product obtained from this industry is copra cake and meal. The only place which can be found where this material is being fed in the United States at the present time is about one or two local points in California. The imports of copra during the last two years have fallen off considerably. Manufacturers who are using coconut oil claim that the oil can be imported more economically than they can import the raw copra and crush it in this country. European feeders and people in this country who are using copra meal find that it is a valuable feed stuff. It is especially valuable as a dairy feed. At the present time this feed is of very little economic importance in the United States, since this country produces more concentrated feed than her cattle now consume. There may come a day when copra meal will have a great economic value in this country, but that time seems far off.

OTHER OIL MEALS.

Peanut and soy-bean meals and cake are of more importance than copra meal, since both peanuts and soy beans are grown extensively in portions of this country. These meals are the by-products of the manufacture of oil from these seeds. Large amounts of peanuts are crushed at Marseille, France. Soy beans are crushed most largely in Manchuria and to some extent in England. In some sections of Germany the dairy feeders prefer peanut meal to any other oil meal, and feed it as the principal source of protein. It is in good demand everywhere on the European Continent. Peanut cake in Europe, like linseed cake and meal in this country, has become so popular that the price has advanced to a point where it is not considered as economical as some other forms of oil meal.

Soy-bean meal is a product that has sprung into prominence in European countries in the last few years. Soy-bean cake has been imported from Manchuria to some places on the Pacific coast, and reports are to the effect that its use has been quite satisfactory.

With the development of the industry of expressing oil from peanuts and soy beans an additional quantity of high-protein feed will be added to our present supply of such feeds.

In European countries oil meals are fed mostly in the cake form. The people are suspicious of most ground feeds, since feed in such form offers better opportunity for adulteration. In shipping from this country, cottonseed cake is much easier handled and less waste is incurred than if shipped as meal in bags. Europeans prefer to feed oil cakes that have been "checkered." In preparing the cake in this way "crisscross" lines mark the cake off into smaller cakes which are uniform in size and weight. When marked in this way the cake is handier to feed, since the weight of each cake is known, and each small cake can be easily and cleanly broken off from the large cake. In feeding this material some English feeders break the cake and place each cow's ration directly in her mouth.

English feeders use large quantities of "compound" cakes. These cakes are mixtures of different materials, chief among which are oil meals of different kinds, corn, wheat, bran, molasses, etc. We annually ship about 50,000 tons of molasses to England, most of which is used as a "binder" and appetizer in the manufacture of the "compound" cakes.

As yet none of these mixed commercial feeds have been pressed into the cake form in this country. The use of mixed or commercial feed has been somewhat discouraged here, since certain firms have not been as careful to turn out a good product as they might have been. To a certain extent the use of such feeds is to be recommended, since their manufacture offers use for large amounts of alfalfa hay and other roughages which are "off color" or slightly inferior in other respects and would not otherwise find a market. The manufacture of these feeds also offers a market for large quantities of molasses which would be rather hard to market in any other way. If the content is plainly marked upon the bags and if adequate laws are enacted for marking and branding such materials their use is to be recommended unless other feed can be purchased more economically.

The analyses of some of the more common oil meals are given in the following table, which was compiled from data in Henry and Morrison's "Feeds and Feeding":

Analyses of oil meals.

Feed.	Dry matter.	Protein.	Carbohydrates.		Fat.
			Fiber.	Nitrogen-free extract.	
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per ct.*
Cottonseed meal (choice)	92.5	44.1	8.1	25.0	9.1
Linseed meal (old process)	90.9	33.9	8.4	35.7	7.5
Soy-bean meal	88.2	41.4	5.3	28.7	7.4
Coconut meal (low in fat)	90.4	20.9	11.2	45.3	8.1
Palm-nut cake	89.6	16.8	24.0	35.0	9.5
Peanut cake (hulled nuts)	89.3	47.6	5.1	23.7	8.0
Sesame cake	90.2	37.5	6.3	21.7	14.0

It will be noticed from this table that the feeds highest in protein are peanut cake and cottonseed meal. Those highest in carbohydrates are palm-nut cake, copra or coconut cake, and linseed meal. In fat sesame cake stands first.

In most feeding operations some one of these oil meals or cakes is essential, because they supply protein not only in its needed form but with greater economy than it can be obtained from other sources. In view of the fact that we are feeding but a small portion of our production of these materials, effort should be made to create a more general demand for them.

Cottonseed meal is a good fertilizer, but as it can be fed to beef or dairy cattle with a loss of but one-fourth of its fertilizing elements it is a most economical feed to use. A full discussion of the feeding of cottonseed meal to beef cattle is given in Farmers' Bulletin 655, "Cottonseed Meal for Feeding Beef Cattle."

In the United States but 24 pounds of cottonseed meal is fed per head of cattle, while in some of the European countries from 250 to 500 pounds are fed to each cow annually. This shows the possibility of increasing the amount fed in this country. The results of such additional feeding would be increased production of beef and dairy products to be used for home consumption and export. At the same time the productive power of our soils would be greatly improved.

MISCELLANEOUS ROUGHAGES AND GRAZING CROPS.[1]

WINTER WHEAT AND OATS.

In some sections of the United States it is a common practice to graze cattle on winter wheat and winter oats during the winter or spring months. It is true that oftimes such pasture is available only during short periods of time, but with careful management the length of time that such pasture can be grazed can be increased. The chief obstacle in the way of pasturing these winter crops is the damage done to the crop by the cattle during wet weather. Proper tiling and draining of the soil will lengthen the period during which these crops may be pastured. Winter wheat and winter oats are very seldom seriously injured by grazing when the soil is not too wet. In fact, during winters that are favorable to maximum growth of these crops grazing is an actual benefit.

Cattle thrive on such crops, and often no other food is necessary while they are on such pasture. These crops are especially good for growing calves and young stock, but in addition some grain and a little dry roughage, as hay or stover, should be fed. The season in which winter wheat and oats may be pastured depends upon the

[1] This report does not attempt to discuss all of the different crops which may be grown in certain sections, but only such crops as are comparatively new or other crops which can be more efficiently used.

section of the country and climatic conditions. In the extreme South such pasturage often lasts through the entire winter, and some feeders do not cut the grain but pasture it entirely, while in other sections of the country these crops may be grazed for less than a month.

CACTUS.

The feeding of cactus or prickly pear is purely a local matter. Its growth is confined to the coastal region of Texas, Louisiana, and Florida, the southern half of California, and the southern portion of Arizona and New Mexico.

In those sections the wild cactus, prickly pear, or tuna has for years been used very successfully in the wintering of stock. The tuna is covered with very sharp thorns and cattle will not eat it freely unless the thorns are singed off. Gasoline torches are used for singeing the spines. Where cactus is relatively thick one man can singe the spines from enough prickly pear to feed 400 to 500 beef cattle a day.

A great many cattlemen are of the opinion that spineless prickly pear will never be grown successfully under range conditions, as they believe the cattle would eat it too close and it would be destroyed.

Cattle will winter in fairly good condition on prickly pear and a small allowance of cottonseed cake daily. In some sections on the larger ranches cottonseed meal and cottonseed hulls are mixed together in immense self-feeders, which often hold as much as a carload of this material. The cattle eat at will from these feeders and have in addition all the "singed" prickly pear they will consume.

To date it has not been determined whether prickly pear can be grown economically under cultivation. There are other forage crops which when cultivated may be more satisfactory than prickly pear in sections where cultivation can be practiced. It is not believed that cactus will ever be a great factor in cattle feeding in this country.

SUGAR CANE.

In the extreme southern portions of the United States sugar cane grows very readily, and makes an immense tonnage per acre. It has been used to a limited extent for cattle feeding. In Cuba and Porto Rico the thousands of work oxen are fed very largely upon sugar cane. The green stalks are cut into short pieces with a machete and the oxen eat the entire stalk and leaves. The horses of those countries are fed considerable sugar cane and a small amount of corn. During the dry season when pastures are very poor the cattle are frequently fed sugar cane to carry them through the dry period.

If the entire sugar-cane plant will make silage which will compare favorably in feeding value with sorghum silage, then cane should

in the future be largely used as a silage crop because of the enormous yield per acre.

Japanese sugar cane is a smaller variety of sugar cane which can be planted much thicker. It has been used to a considerable extent for silage in Florida, and very satisfactory reports have been received from feeders who have used it.

FETERITA.

Feterita is an early-maturing drought-resistant sorghum and has special value from an economical standpoint in the South and Southwest. The average growing period of feterita is about 105 days. The stalks are from 4 to 7 feet high, and are tender and palatable. They sucker and branch freely under favorable conditions.

The plant will yield from 10 to 40 bushels of grain per acre. The Texas substation at Lubbock, Tex., has obtained a yield of 57.7 bushels per acre. In more recent tests feterita has shown a somewhat smaller yield. Two varieties of feterita at the Lubbock station during the summer of 1915 showed an average yield of 46.4 bushels. The following yields were obtained for standard, dwarf, and white milo, respectively: 61.4, 68.4, and 61.8 bushels. The yield of fodder will run from 1 to $2\frac{1}{2}$ tons per acre. An unofficial statement is to the effect that 10 bushels of the grain of feterita are equal in value to about 9 bushels of corn.

The fodder of feterita is somewhat better than that of milo, but both kafir and sorghum furnish fodder of somewhat better quality than either of these materials. All sources of information seem to indicate that the feeding value of these four feeds is almost the same.

SUDAN GRASS.

The growing of Sudan grass in the last few years has become an industry of no small importance. Seed growers have exploited the growing of this crop very extensively and farmers are usually well satisfied with the results which they have obtained. Sudan grass gives a very heavy yield of fodder, and this, together with its drought-resisting qualities, makes it a very valuable forage in sections where it will grow.

Favorable reports concerning this crop have come from all sections of the country, from central South Dakota to Texas, and eastward to the Atlantic seaboard, showing that it has an extremely wide range as a useful forage crop. Yields of from 2 to 5 tons of hay per acre are usually secured when the grass is planted in rows and cultivated. It very closely resembles Johnson grass, but does not have the creeping rootstocks, so does not become a pest. When cultivated it sometimes attains a height of 8 to 10 feet, and when sown

broadcast it grows from 4 to 5 feet high. Experiments indicate that it has a feeding value about equal to that of the sorghums and timothy hay.[1]

TEOSINTE.

Teosinte produces a heavier yield of fodder than any other crop grown in this country. Georgia has obtained a yield of 38,000 pounds, Mississippi 44,000 pounds, and Louisiana more than 50 tons per acre. To grow this crop successfully long seasons, hot weather, and abundant moisture are necessary. The stalks grow from 6 to 12 feet high. The stalks are tender and the leaves are abundant. If allowed to stand until September or October the fodder makes good silage. In Louisiana this crop has sold for $2 per ton while standing in the field. The experiment stations which have grown teosinte recommend it highly as a cattle feed in either the fodder or silage form. It is palatable and nutritious, but because of its rank growth some trouble is experienced in curing it.

OTHER FORAGE CROPS.

Other crops which have economic value and should be grown more extensively in certain sections are velvet bean, kudzu vine, sweet clover, cassava, beggar weed, and rape. Other farm crops might be mentioned, but those named are of peculiar economic value in sections where they are grown.

ROOT CROPS.

No good English or Scotch feeder would think of keeping a breeding herd without mangels, beets, turnips, or some other such feed. The use of root crops in the feeding of cattle involves somewhat more labor than if they are fed other material, but at the same time where such crops have been used feeders have found it profitable. The growing and feeding of root crops is to be advised only in specific cases in this country, as the high cost of labor sometimes prohibits the economical production of such crops. Where labor is relatively cheap and intensive methods are practiced, roots may be produced and fed to advantage.

Root crops are especially valuable for feeding young stock and breeding cattle and cattle which are being fitted for show purposes. As they are very succulent and palatable, they are excellent feed for cows which are suckling calves. As long as large farms exist and labor is expensive it is doubtful if root crops will become popular, as silage crops can be raised and harvested more cheaply.

[1] See Farmers' Bulletin 605, Sudan Grass as a Forage Crop; also Kansas Industrialist, May 1, 1915.

ANIMAL BY-PRODUCTS.

The by-products of the packing industry in this country offer an abundant source of highly concentrated and very nutritious feed. The use of these materials, however, is limited mostly to swine and poultry, and for fertilizing purposes. In small amounts they have value as cattle feed, but because of the slightly rancid taste of such feeds cattle do not relish them as highly as they do the concentrates of vegetable origin. Chief among the animal by-products are tankage, blood meal, and fish meal. Large amounts of all these materials are being used for fertilizing purposes. It is probable that fish meal may be used quite extensively at some future time for supplementing a corn ration for hogs, but it will probably not gain favor rapidly as a catle feed.

BREWERS' AND DISTILLERS' BY-PRODUCTS.

Among the by-products of breweries and distilleries are dried brewers' grains, brewers' slop, distillers' grains, both slop and dried, and malt sprouts. All of these materials are of great economic value in cattle feeding, but their use, with the exception of the dried products, is limited to places near the point of manufacture. Almost the entire product of these plants is being used in this country and as a rule no class of feeders pays more attention to the details of the feeding operation and the profits arising therefrom than feeders who are using these materials. Large numbers of cattle are finished annually at distilleries and breweries. Up to within recent years the cattle were finished at these plants for export trade, but now they are used in the home consumption.

Other concentrates as well as more roughages should be fed with the slop. Feeders of these materials seldom have used enough roughages in the finishing of such cattle. More attention should be given to the sanitary condition of pens where slop is fed. If such places were kept cleaner, more bedding used, and more liberty given the cattle, the feeding would probably show greater profits.

CANNING FACTORY REFUSE.

In certain districts, where crops are grown for canning, by-products are available which are very valuable sources of green feed. These feeds as a general rule should either be fed fresh or put into the silo. Among the materials of this kind available are pea vines, corn husks, cobs, etc.

Some companies engaged in the canning of these materials have their own silos and buy and fatten cattle on the refuse material from their factories. Others haul the material into immense piles and dump it. The teams hauling the material tramp it well. The feed

keeps well on the inside of the stack and is in fact silage; but enormous losses occur when the feed is handled in this manner. The refuse from canning factories is used to a considerable extent at the present time, and the greatest waste is in the method of storing it. If it were all stored in silos the waste would be less.

BEET PULP.

In Colorado, Utah, Montana, California, Michigan, and Nebraska large quantities of beet pulp are produced at sugar refineries. In those States experimental work has been done with this feed and it has given very satisfactory results. Some of the pulp is hauled in the fresh state to the farm and ensiled, but most of it is piled in immense inclosures having plank floors so that some of the water can drain out. The pulp, when fresh, resembles boiled turnips, but the outer part of the pile soon molds and forms an air-tight cover for the remainder, in this manner aiding in the preservation of the pulp. It is taken daily from the silo or inclosure, as the case may be, and placed in the feed bunks for the cattle. Considerable care must be used to see that the feed bunks are cleaned after each feeding and that the pulp is supplied in the fresh state. It is advisable to feed good first-cutting alfalfa hay with the pulp, to overcome its laxative effects. Steers on hay and pulp will not finish out as highly as cattle that are on a ration of hay and grain, but the feeding is often very profitable.

Much of the pulp now produced is dried and sold on the market for feeding purposes as dried beet pulp. It is extensively used as a feed for dairy cows. Most of the beet pulp produced in this country is used economically, and there is no prospect of increasing the roughage supply to any extent by better methods of utilizing this by-product.

SUGAR-CANE TOPS AND BAGASSE.

Some experiments are being conducted in Louisiana to determine whether sugar-cane tops which are not used in the manufacture of sugar can be used advantageously for silage, and to determine whether bagasse is of any value as a cattle feed. The tests that have been made indicate that cane tops make a fairly satisfactory silage. As there are thousands of acres in cane, much of which will make 50 tons or more of cane to the acre, there has been an enormous waste in the tops and leaves, which have heretofore been burned. If the tops prove really satisfactory for silage, it will mean that the large sugar planters of the South can handle beef cattle as a side issue. The cattle can be grazed during the summer and wintered on cane-top silage and cottonseed meal, both of which will be relatively cheap in price.

If the bagasse proves to have much feeding value, large numbers of cattle may be fed near the sugar mills. Such cattle would probably be fed on bagasse, cane-top silage, blackstrap molasses, and cottonseed meal. The bagasse contains such a high percentage of crude fiber that it may prove unsatisfactory as a feed. At the present time it is used as fuel at the sugar mills. Then, too, the bagasse may prove to be too constipating unless it is finely cut up and fed with some laxative feed. The use of molasses should aid in correcting that tendency.

BLACKSTRAP MOLASSES.

Blackstrap molasses is a by-product of the sugar industry that has gained in favor rapidly among cattle feeders in the last few years. All of the blackstrap which is produced in the United States is sold at reasonable prices. There is little waste of this product. Molasses is not only fed by farmers extensively, but nearly every commercial mixed stock feed put upon the market contains some molasses.

Attention is called to the production of enormous quantities of blackstrap molasses in Cuba and Porto Rico. Some of the manufacturers of mixed feeds in this country are importing the molasses they use from Cuba, as it can be imported much more cheaply than it can be purchased in the United States. Blackstrap in the United States costs from 9 to 16 cents per gallon. One dealer imported 5,000,000 gallons into this country from Cuba for a total cost of about 5 cents a gallon.

Some of the sugar factories in Cuba burn the molasses or dispose of much of it in a very uneconomical manner, although a small amount of it is used for feed. This is one feed which can and should be imported into this country in large quantities so long as the price remains so much lower than in the United States.

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